(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 825 022 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
25.02.1998 Bulletin 1998/09

(51) Int. Cl.^{6}: B41F 33/00

(21) Application number: 96202333.9

(22) Date of filing: 23.08.1996

(84) Designated Contracting States:
BE DE FR GB NL

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(54) **Digital control strip for imageable media**

(57) A digital control strip for imageable media such as a printing plate or photographic film is described, whereby the digital control strip is to be applied to the imageable medium by a raster output device ; the digital control strip comprising :

control fields, each field including at least one element, wherein each element is output device dependent and is not scalable and the fields are scalable independent of the elements.

The invention also includes a method of using the digital control strip to monitor the quality control of an imaging system such as a computer-to-plate system.

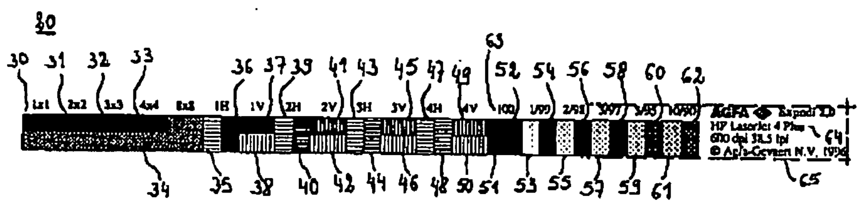

Fig. 2

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Description

1. Field of the invention.

The present invention relates to devices and methods for exposure and photographic control of imageable media including photographic film and printing plates. More specifically the present invention relates to a digital control strip suitable for quality control of imaging devices, proofing devices, printing devices and imaged media.

2. Background of the Invention

Several types of control strips are known. As described in US-4,852,485, analogue control strips have been used, which consist of a piece of patterned film which could be attached onto a lithographic film before contacting it to a printing plate.

CH-A-681 929 describes a test "wedge" or control strip which is stored as a digital quantity on a storage medium such as a "floppy disk" or in a computer and is incorporated herein by reference. The control strip consists of a variety of control fields. Each control field contains a pattern, e.g. a star target, types, a line series, which may contain elements, e.g. checker-board squares, lines or dots. The control strip is of a fixed size having the dimensions 17 mm by 161 mm or 17 mm by 191 mm including colour fields. The system parameters interrogated by this known system are recording density in dots per inch (dpi).

EP-A-0 518 559 describes a method and apparatus for creating a control strip and is incorporated herein by reference. A digital representation of the control strip is printed to form a visible, analogue representation of the control strip. The control strip may be printed at the same time as a main coloured image to be reproduced. The control strip consists of control fields and the elements of the control fields can be user defined. The control strip is 12 mm wide.

PostScript™ is a programming language created by Adobe Systems Inc., California, USA for defining page, lettering, colour and graphics parameters of images to be output by a raster output device such as a printer, an imagesetter or a platesetter.

PostScript™ is described in the "PostScript Language Reference Manual", second edition, Addison-Wesley, 1990 (hereinafter referred to as "AdobeRef") and incorporated herein by reference. PostScript™ files may be incorporated in the file for a main image as an encapsulated PostScript file (EPS file), as described in Appendix H, pages 709-736 in AdobeRef.

The general techniques of colour reproduction, e.g. printing, photographic films, display devices, are described in "The Reproduction of Colour in Photography, Printing and Television", by Dr. W. G. Hunt, Fountain Press, UK, 1987 and incorporated herein by reference.

3. Objects of the Invention

It is an object of the present invention to provide a method and apparatus to control an imageable medium and/or an imaging device for correct exposure.

It is a further object of the present invention to simplify routine control of the image quality of imaging devices, proofing devices, printing devices and imaged media.

It is still a further object of the present invention to reduce waste of imaged materials in the set-up/proofing stage of the reproduction of colour and black and white images.

It is yet another object of the present invention to improve the reliability of routine control of the image quality of imaging devices, proofing devices, printing devices and imaged media and to make this control less operator sensitive.

It is a further object of the present invention to optimise the size of a digital control strip while maintaining functionality as a quality control instrument.

4. Summary of the Invention

The above objects are realised by the specific features according to claim 1. Preferred embodiments are given in the dependent claims.

Preferably, the control strip according to the present invention is described by PostScript™ commands. This gives the freedom to incorporate the strip in computer-to-plate and computer-to-film applications even in the last stage of printing plate production.

The digital control strip according to the present invention is preferably described as a set of PostScript™ commands but the invention is not limited thereto.

An important advantage of the control strip in accordance with the present invention is its ability to be scaled to a small size. The width may preferably be less than 12 mm, more preferably less than 10 mm, down to 5 mm, whereas its

length may be, for example, 145 mm for an imagesetter or platesetter having a spatial resolution of 2400 or 3600 dpi, which corresponds to 94 to 142 dots per millimetre.

In a preferred embodiment the control strip in accordance with the present invention is placed at a location on the imageable medium which is image-wise functionally irrelevant. For instance, it may be placed on a printing plate at a location which remains ink-free during the subsequent printing process.

A preferred arrangement of control fields in accordance with the present invention is defined in claim 16. The advantage of this arrangement is that a field with a high probability of 50% image density is located closely, preferably directly adjacent to other control fields of higher resolution and the comparison is, thus, easier and more reliable.

The present invention also includes an imageable medium according to claim 12 and a method in accordance with claim 13.

Further objects, advantages and embodiments of the present invention will become apparent from the following description and drawings.

5. Brief description of the drawings

Fig. 1 shows a schematic block diagram of an imaging process in accordance with the present invention.
Fig. 2 shows a digital control strip in accordance with the present invention.
Fig. 3 shows a checkerboard field in accordance with the present invention.
Fig. 4 shows adjacent pixel line fields in accordance with the present invention.
Fig. 5 shows adjacent raster fields in accordance with the present invention.
Fig. 6 shows a unit pattern of a pixel line field in device space in accordance with the present invention.
Fig. 7 shows a unit pattern of a checkerboard field in device space in accordance with the present invention.
Fig. 8 shows a unit pattern of a raster field in device space in accordance with the present invention.
Fig. 9 shows a schematic top-view of an offset printing plate in accordance with the present invention.

6. Detailed description of the invention

In the following the present invention will be described with respect to certain specific embodiments but the present invention is not limited thereto but only by the claims. In particular, the present invention will be described for convenience with reference to the Adobe PostScript™ programming language and to the drawings but the invention is not limited thereto.

General methods of preparing imageable media are described in EP-A-0 518 559. Fig. 1 is a schematic block diagram of such a system 1. A computer 2 or similar device is used to create a digital representation of an image optionally using a scanner 3 to scan in an image or a store 4 of pre-recorded images which may be accessible optionally via a network 5 such as the Internet. Digital representations of images may be created by graphics software such as Quark XPress™, Adobe PhotoShop™, Adobe Illustrator™, Aldus™ Pagemaker™, Corel Draw™ or similar. The digital representation is preferably stored as an output file 6 in a graphics software and output device independent programming language such as PostScript™. The present invention is not limited thereto. The output file 6 is transferred to a raster output device 10 such as an imagesetter, optionally via a LAN or network 7. Either in the raster output device 10 or elsewhere, an interpreter 8 is provided for conversion (raster image processing) of the output file 6 into an output device specific raster data file 9 which can be processed by the raster output device 10 by scan conversion. It is understood that the raster output device 10 may include further separate or integrated devices necessary for the development of the imageable medium, e.g. the developer and fixer for the photographic film or printing plate. The output of the raster output device is an imaged medium 11. e.g. a photographic film or a printing plate. The imaging system 1 may be a computer-to-plate system.

An example of a suitable raster output device 10 may be a Creo PlateMaster controller linked to a Creo 3244 platesetter with plate conveyor, plate processor and plate stacker all supplied by Creo Products Inc. Bunaby, B.C., Canada. The interpreter 8 may include a Creo Allegro RIP station supplied by the same company compatible with PostScript™ Level 2. Suitable imageable media may be N90a printing plates provided by Agfa-Gevaert AG, Wiesbaden, Germany or Lithostar LAP-0 printing plates supplied by Agfa-Gevaert N.V., Mortsel, Belgium. The printing plates may be based on a thin metal sheet such as electrochemically roughened and anodized aluminium (most common plate thicknesses are 6 mil, 8 mil and 12 mil, i.e. respectively 0.15 mm, 0.20 mm, 0.30 mm) or have a polymeric base such as polyester. For colour printing it is usual to provide a set of colour separated printing plates, e.g. cyan, yellow, magenta or cyan, yellow, magenta and black. In accordance with the present invention the same control strip may be used independent of the colour to be used with the printing plate.

A suitable raster output device 10 also may be an imager for photographic film such as the SelectSet Avantra44™ supplied by Bayer Inc., Agfa Division, Wilmington, USA.

A further suitable raster output device 10 may be a printer such as an ink jet, thermal transfer or electrostatic printer.

Examples are : a DesignJet™ 750C supplied by Hewlett-Packard Corp., USA ; a Summachrome™ Imaging system supplied Summagraphics Inc., USA ; or a Chromapress™ system supplied by Agfa-Gevaert N.V., Mortsel, Belgium.

Raster output devices 10 are usually calibrated in accordance with the relevant manufacturer's instructions at regular intervals. Such complex procedures are not suitable for routine production control of imaging quality. The digital control strip in accordance with the present invention has been designed to provide rapid, direct and reliable routine control of imaging quality , in the case of printing plates preferably before the actual printing on the plate starts, while taking up the minimum of space on the imaged substrate.

The digital control strip 20 in accordance with the present invention is shown in Fig. 2. It comprises a plurality of control fields 30 to 62 preferably arranged pairwise such as fields 30 to 33 and 34 ; 35, 36 ; 37, 38 ; etc. and preferably also text 63, 64. The outer dimensions of the digital control strip 20 (called the bounding box, 65) are typically 12 mm or more preferably 10 mm or less in width and 145 mm in length. Fields may be grouped together for comparison purpose, e.g. checker board fields 30 to 34, line fields 35 to 50, raster fields 51 to 62. In accordance with the present application these groups of related fields are described as a "field set". Thus the control strip 20 shown in Fig. 2 has three main field sets :

1) a checkerboard field set including fields 30 to 34 ;
2) a pixel line field set including fields 35 to 50 ; and
3) a raster field set 51 to 62 ;

as well as text 63, 64.

The three basic types of field in accordance with the present invention are shown in Figs. 3 to 5. Fig. 3 shows a checker board field 33, Fig. 4 shows pixel line fields 35, 36 and Fig. 5 shows raster fields 61, 62. Each field 30 to 62 includes one or more elements, e.g. dots 66, lines 67 or fills 68. Dots, lines or fill are made up of an array of adjacent device or recorder pixels or microdots 69 (hatched area in Fig. 3). In accordance with the present invention a pixel or microdot is the smallest addressable spatial unit of the output device on the imageable medium. For a printer, imagesetter or platesetter it is the fundamental spatial unit or dot which makes up all other graphical structures such as lines or fill. For output devices, microdots or pixels are also called device pixels or RELs (Raster Elements). A typical dimension for a pixel on a 400 dpi printer is 63.5 µm, and 7 µm on a 3600 dpi imagesetter.

The elements (66, 67, 68) may make up a pattern (33, 35, 61) with a repetitive pattern cell which is tiled in order to fill up the area of the relevant control field. Alternatively, the control field may include a series of lines or larger dots arranged in a predetermined pattern. One larger dot preferably comprises an integer number of pixels or microdots.

The digital control strip 20 in accordance with the present invention is scalable. Scalability refers to the ability of the digital control strip to be transformed, i.e. resized to a different physical size, e.g. smaller or larger in one or two dimensions. According to the present invention, the strip is designed such that the integrity of the pattern within the fields is maintained. This means that scaling has no influence on the number of pixels in an element (66, 67, 68) of a pattern, nor on the relative location of the device pixels or microdots in the element. Thus, when the outer dimensions of a field are altered differently in two orthogonal directions, the field is deformed but the elements (66, 67, 68) within the field are not deformed. The undeformed elements fill the deformed field - if the field has become smaller, the number of elements in the field reduces. This property of the digital strip in accordance with the present invention may be achieved by defining the elements of a field in device space and the size of the fields themselves in user space. Device space is the internal co-ordinate system used by the raster output device 10 for scan conversion of the raster data file 9 and is usually expressed or "measured" in "pixel" units. User space is the internal co-ordinate system used to create the output file 6 in the device independent language such as PostScript™ and is usually expressed in metric units such as 1/72 of an inch (see AdobeRef, page 151) or millimetre. In order to convert the output file 6 to the raster data file 9, a current transform matrix (CTM) may be used (see AdobeRef, 4.3.2 Transformations, pages 152-154). This matrix converts the data in the output file 6 into data in raster data file 9 taking into account any difference in resolution between the co-ordinate systems of the user space (the device independent language) and the device space (raster output device 10). Thus, a distance of X units in the user space defined in output file 6 is converted by the CTM into the appropriate number of pixels Y in the device space which result in the same physical distance in device space as is represented by X units in the user space. Hence, by use of CTM the distance produced by the output device 10 is independent of the resolution of the output device 10.

On the other hand, data in output file 6 which is defined in device space is left untouched by the CTM. Thus X distance units of device space defined in output file 6 result in X distance units in device space. The actual size, in metric units, of elements defined in the device space is device dependent - the size depends on the number of dpi (microdots per inch) of the output device 10. For instance, the device space distance X printed by a 300 dpi printer would be 10 times larger than by a 3000 dpi printer. In general, specifying data in device space is discouraged as the appearance of the data is device dependent and may seem to be deformed relative to user space.

Further explanations of the terms such as user space, device space, pattern, pattern cell, tiling, fill, CTM, scan con-

version may be found in AdobeRef which has already been incorporated herein by reference.

Fig. 3 shows a checkerboard field 33 in accordance with the present invention. It is made up of a repetitive element 66 or pattern cell of 4 by 4 black device pixels combined with 4x4 white or transparent pixels resulting in a theoretical (perfect set-up) 50% density pattern. If the dot gain on the imageable medium 11 in the output device 10 is greater than desired, the area of the black square increases with respect to the white square and the density is above 50%. The dot spacing and the element spacing is defined in device space, whereas the dimensions of the field 33 are defined in user space. Field 33 is scalable and its size may be defined by the user. Depending on its size, the field 33 is filled up with as many elements 66 as required, the elements 66 being clipped at the boundaries of field 33. As the pattern elements 66 are defined in device space, their actual size on the imaged substrate is dependent on the resolution of the output device. On the other hand the size of the field itself is set by the user.

Fields 30, 31, 32, 33 and 34 have checkerboard patterns with 1x1, 2x2, 3x3, 4x4 and 8x8 microdots or device pixels and each has a theoretical (perfect set-up) optical density of 50% on average. Although the present invention has been described with the checkerboard patterns of the above sizes, the invention is not limited thereto. The checkerboard patterns may be adjusted in size, e.g. perhaps 3x3, 4x4, 5x5, 6x6 and 11x11, as appropriate for the particular application. Once the suitable sizes have been established for this particular application, they are preferably kept constant.

A particular aspect of the present invention is to place a reference pattern of one of the checkerboard patterns along the complete length of the other checkerboard patterns. Preferably, the reference pattern is the pattern (the 8x8 pattern 34 as shown in Fig. 2) which has a high probability of providing an optical density close to 50% even if the output device 10 is not set up correctly. The close proximity of the reference pattern 34 and the other patterns (30, 31, 32, 33) allows easy comparison there between. If on using a specific film or plate material on a given raster output device 10, it turns out that one particular field, e.g. the checkerboard 2x2 field 31, has the same density as the 8x8 field 34, a comparison of only these two fields is necessary to check continued quality during the current production run.

Fig. 4 shows two adjacent line fields 35, 36 in accordance with the present invention. Field 35 has a white background with a series of black lines 67. Field 36 has a black background and the lines 67 of field 35 are represented in white. The thickness of the lines 67 is determined in device space whereas the distance between the lines 67 is determined in user space. Accordingly, the thickness of the lines 67 is output device dependent whereas the distance between the lines 67 is output device independent.

Fields 35, 36 ; 39, 40 ; 43, 44 and 47, 48 have horizontal lines with thicknesses of 1, 2, 3, and 4 device pixels respectively, whereas fields 37, 38 ; 41, 42 ; 45, 46 ; and 49, 50 have vertical lines with thicknesses of 1, 2, 3, and 4 device pixels respectively. Although the invention has been described with reference to the above line thicknesses, the invention is not limited thereto. The line thicknesses may be selected appropriately depending upon the application.

Fig. 5 shows a pair of raster fields 61, 62 in accordance with the present invention. Field 61 has a density of 10%, i.e. 10% of the area 61 is filled with black microdots, while 90% is filled with white microdots. Black microdots are clustered in halftone dots 68. These halftone dots 68 are arranged along a regular quadratic grid, called halftone raster of screen, having a screen angle and a screen ruling. The screen angle of the halftone dots 68 in Fig. 5 is actually 45°. The screen ruling is given by the multiplicative inverse of the period of the halftone dots 68. The period is the shortest distance between the centres of two different halftone dots, and is measured along a line parallel to the screen angle. The clustering of microdots into halftone dots, i.e. the relative position of black microdots in the neighbourhood of the halftone dot centre 68, in order to achieve a 10% density, is dictated by the "screening type", usually given by a "screen function" or "spot function". The screening type used in the preferred embodiment shown in Fig. 2 is Agfa Balanced Screening.

Field 62 has a density of 90%. This is achieved by a black background, having 10% of the area filled with white halftone dots, thus leaving black 90% of the microdots. The white halftone dots are also arranged on a regular grid, having a screen angle and a screen ruling. The shape of the white halftone dots, i.e. the relative position of the clustered white microdots with respect to the centre of each halftone dot, is dictated again by the spot function.

The size and shape of the halftone dots 68 in the raster fields 61 and 62, along with the screen angle and line ruling, are determined in device space, i.e. are output device dependent. The size of the halftone fields 61 and 62 is determined in user space, i.e. is output device independent.

Fields 53 and 54 have a dot percentage of 1% and 99% respectively. Fields 55 and 56 have a dot percentage of 2% and 98% respectively. Fields 57 and 58 have a dot percentage of 3% and 97% respectively. Fields 59 and 60 have a dot percentage of 5% and 95% respectively. In this preferred embodiment, the fields are arranged pair-wise, having complementary dot percentages, although another arrangement may also be suitable. The screen angle, the screen ruling, the spot function and the various dot percentages may be selected appropriately depending upon the application.

Fields such as field 33 ; 35, 36 ; 61 or 62 may be generated in PostScript™ in the following manner with reference to Fig. 6 :

```
<<
    /PaintType 2          /PatternType 1
    /TilingType 2         /BBox [0 0 8 1]
    /XStep X_StepL        /Ystep 1
    /PaintProc { 8 1 true [1 0 0 1 0 0]  {<80>}  imagemask  }
>> matrix makepattern
/OnePixelLinesVer exch def
```

This program listing fragment defines a pattern "OnePixelLinesVer" which is 8x1 pixels in a matrix 81 of 8x8 pixels in the device space. The pattern consists of a vertical line having a thickness of one microdot or pixel in the device space. The pattern is defined in an 8x8 matrix 81 so that the line width may be amended to be up to 8 pixels in thickness in other fields. The repetition distance between two matrices 88, X_StepL, is defined in user space (not listed above) so this repetition distance is output device independent. The complete field is defined in user space :
0 0 X_field Y_field 1.0 /PixelLinesVer setpattern rectfill
which generates a field of the required size which is filled by the pattern OnePixelLinesVer and is clipped at the boundaries of the field. Note also that the field is scalable in user space without altering or deforming the pattern of the element OnePixelLinesVer which is defined in device space.

To create a checkerboard pattern, the above script may be amended to create four alternating 4x4 device pixel black and white squares in the 8x8 matrix 82 as shown in Fig. 7. In this case the distance X_StepL is not defined. Instead the 8x8 matrix 82 is specified as the pattern cell and tiled within the field by means of the rectfill command. This generates a pattern of black and white, 4x4 device pixel squares which is device dependent and non-scalable. The field dimensions are again specified in user space using scalable dimensions.

A portion of a raster field 55 is shown in Fig. 8. In accordance with the present invention the Agfa Balanced Screen having a screen angle of 45° is used with the digital control strip. The Agfa Balanced Screen is described in EP-A-0 525 520 which is incorporated herein by reference. As shown in Fig. 8, the fundamental pattern of a raster field consists of two groups - referred to as clusters of halftone dots - of device pixels or microdots in a 22x22 matrix 83 in device space. The 22x22 matrix 83 forms the pattern cell and is tiled within the field and clipped at its edges. The invention is not limited to a 22x22 matrix as is explained below.

Each group of pixels makes up a halftone dot so that a halftone dot is arranged in a "halftone cell" represented by 22x22/2 = 242 pixels. The number of device pixels which are coded "1" (i.e. would print colour, e.g. black in fields 53, 55, 57, 59, 61 ; or would be coded "0" and would print white in fields 54, 56, 58, 60 and 62) is shown as 4 in Fig. 8 but the invention is not limited thereto. By varying the number of pixels coded "1" in different fields, the way the halftone dots "grow" may be controlled. Hence, pairs of fields 53, 54 ; 55, 56 ; 57, 58 ; 59, 60 ; and 61, 62 have 2, 4, 7, 12 and 24 coded pixels "1" or "0" respectively. The imaginary line 84 joining two halftone dots is oriented at 45° with respect to the vertical axis of the page, this angle being known as the screen angle. The distance in device space between two such imaginary lines is given by :

$$\sqrt{(11x11) + (11x11)} = 15.6$$

device pixels. Thus, in accordance with the present invention, the number of lines per inch, which is called the screen ruling, is dependent upon the resolution of the output device : for an output device with 2400 dpi, the screen ruling is 2400/15.6 = 154 lines per inch. By varying the size of the pixel matrix which represents each halftone dot, the ratio of screen ruling to resolution may be altered, in accordance with the present invention preferably in the range 10 to 20. For instance to obtain a ratio of 10, a 14x14 matrix 83 with two halftone dots should be used, and for a ratio of 20, a 28x28 matrix 83.

In a particular embodiment of the present invention, the field sets are individually scalable and also may be located independently of each other. In this way the control strip 20 is not limited to the linear arrangement shown in Fig. 2. For instance the checkerboard, pixel line and raster field sets may be stacked upon each other or may be separated from each other and located in three separate portions of the imageable substrate.

The digital control strip 20 in accordance with the present invention may be used in the following way. The digital representation of the strip 20 is incorporated into a digital representation of a normal page in the computer 2 as, for instance, an EPS file. This file is imaged directly onto a printing plate. The control strip is preferably located in an image-wise functionally irrelevant part of the page layout. As an example, when used to check the quality of the imager used

to image an offset printing plate without mounting the plate on the press and producing a proof print, the control strip may be located in an area of the plate which is outside the zone to be inked. A flexible offset printing plate 90 is shown schematically in Fig. 9 and comprises a substrate 91, e.g. aluminium or polyester on which an image has been formed after imaging in a raster output device and possibly a subsequent developing step.

Printing press location or registration holes 92 may be provided. Within the confines of the location holes 92, an inkable area 93 is defined. It is within this area 93 that the normal pages or graphic images have been imaged onto the plate 90. There are many arrangements for securing the printing plate 90 to the plate cylinder, as e.g. described in US-4,643,063 as but one example (plate securing on web offset presses). When mounted on the offset printing press, the inkable area 93 will be subjected to the ink roller. Outside the inkable area 93, there is a perimeter area 94 which is not inked and serves no image-wise purpose. This area has the mechanical function of locating and securing the plate to the press but has no function with respect to the reproduction of the image itself, i.e. no image-wise functionality. It is in this area 94 that the control strip 20 in accordance with the present invention may preferably be placed. It is particularly preferred if the control strip 20 is placed in the plate portion of zone 94 which is received in the plate locking or clamping device of the printing plate cylinder.

As the control strip 20 in accordance with the present invention is scalable, it can be fitted to the available space in ink-free zone 94. As the field sets in accordance with the present invention may be treated independently, each field set as well as the text may be located at a different position of ink-free zone 94. Because the field elements are not scalable, they remain suitable for quality control purposes independently of the size of the fields provided these are each greater than a minimum size of preferably 2 mm.

To prevent user distortion of the fields in the control strip in accordance with the present invention, certain parameters of the control strip are pre-determined and not user definable. These include : the screen angle, screen type and screen ruling. Screen angle is the angle of the rows of halftone dots with respect to the vertical or horizontal direction on the page as described above and is preferably fixed to a certain angle, such as 45°. The screening type is predetermined, e.g. a certain type of frequency modulated screening (FM screening) or a certain type of amplitude modulated screening (AM screening / autotypical screening). The screen ruling of a specific AM screening is proportional to the inverse of the distance between the centres of two different halftone dots and is usually expressed in lines per inch. In accordance with the present invention the screen ruling for the raster fields in the control strip is preferably in a fixed relation to the addressability of the device space, typically at a value between 1/10 and 1/20, e.g. 1/15.6 of the addressability. The screen ruling is thus fixed to the addressability of the output device divided by a fixed value between 10 and 20. By selection of the Agfa Balanced Screening (ABS) technology for autotypical screening, selection of a screen angle at 45° and selection of a 15.6 ratio between addressability and line ruling, it is secured that the specific 22 x 22 ABS-tile will be selected for screening. This tile has a predetermined microdot growth in device space. As such it is secured that for any enlargement of the screen fields, the same pattern will be generated for the raster test field. The halftone dots are the elements of the pattern. The number of '1' microdots in a halftone dot and the relative position of the '1' microdots, nor the distance between the dot centres of the halftone dots, will not be influenced by the field size.

Thus, the control strip 20 in accordance with the present invention is realised in device space in accordance with a fixed set of parameters which may be different from the parameters used to create the text or graphic image on the same page. Whereas the control strip may comprise raster fields having a line ruling of 154 lpi, the image data may be screened with a line ruling of 120 lpi. This is acceptable because the control strip is only used for relative quality control purposes rather than for absolute calibration purposes. Accordingly, the screen angle, e.g. 45°, of the control strip 20 may differ from the individual screen angles on colour separated printing plates, e.g. cyan, magenta, yellow or cyan, magenta, yellow,and black, usually at 75°, 15°, 0° and 45° respectively. The control strip is still suitable for quality control of these colour separated plates within one batch produced on the same platesetter as only the relative change within a batch is of importance. This can be assessed quickly and accurately with the control strip in accordance with the present invention.

The predetermination of the various parameters of the control strip 20, make determination of the imaging quality independent of the user, of the type of data to be imaged and of the imaging method and the raster output device. This results in the digital control strip 20 in accordance with the present invention being consistent and reliable in use.

Claims

1. A digital control strip for imageable media such as a printing plate or photographic film, said digital control strip to be applied to the imageable medium by a raster output device ; comprising :

   at least one control field, each field including at least one element, wherein each said element is not scalable and each said field is scalable independently of said elements.

2. A digital control strip according to claim 1 comprising an autotypical screen having a screen ruling, screen angle

and screening type, wherein at least one of the screen ruling, screen angle and screening type are predetermined and may not be user defined.

3. A digital control strip according to claim 2, wherein the screen ruling R (lpi) has a fixed ratio r/R to the resolution r (dpi) of the raster output device.

4. A digital control strip according to claim 3, wherein the fixed ratio r/R is between 10 and 20, and preferably 15.6.

5. A digital control strip according to any of the preceding claims, wherein said fields are organised in field sets, each field set comprising at least one field.

6. A digital control strip according to claim 5, wherein each field set is independently scalable and positionable on the imageable medium.

7. A digital control strip according to any of the preceding claims, wherein said fields include raster, fine pixel and checkerboard fields.

8. A digital control strip according to any of the preceding claims, wherein said control fields include a pxp checkerboard field and at least an mxm and an nxn checkerboard field, m,n,p being integers defined by : m<n<p, and said mxm and nxn fields are directly adjacent to the pxp field.

9. A digital control strip according to any of the preceding claims, wherein the digital representation of the strip is stored in an output device independent language and said elements are defined in device space and said fields are defined in user space.

10. A digital control strip according to any of the preceding claims, wherein the bounding box of said fields is scalable to a dimension less than 12 mm, preferably less than 10 mm.

11. An imaged medium including a digital control strip according to any of the claims 1 to 10 located in an image-wise irrelevant portion of the imaged medium.

12. An imaged medium according to claim 11, wherein the imaged medium is a printing plate for a printing press and the image-wise irrelevant portion is locatable in the locking device of the printing press.

13. A method of assessing imaging quality of an imaging system using the digital control strip in accordance with any of the claims 1 to 10.

14. A method according to claim 13, wherein the imaging system is a system for producing imaged printing plates.

15. A method according to claim 14, wherein the imaging system is a computer-to-plate system.

16. A control strip for imageable media such as a printing plate or photographic film, comprising :

control fields, said control fields including a pxp checkerboard field and at least an mxm and an nxn checkerboard field, m,n,p being integers defined by : m<n<p, and said mxm and nxn fields are directly adjacent to the pxp field.

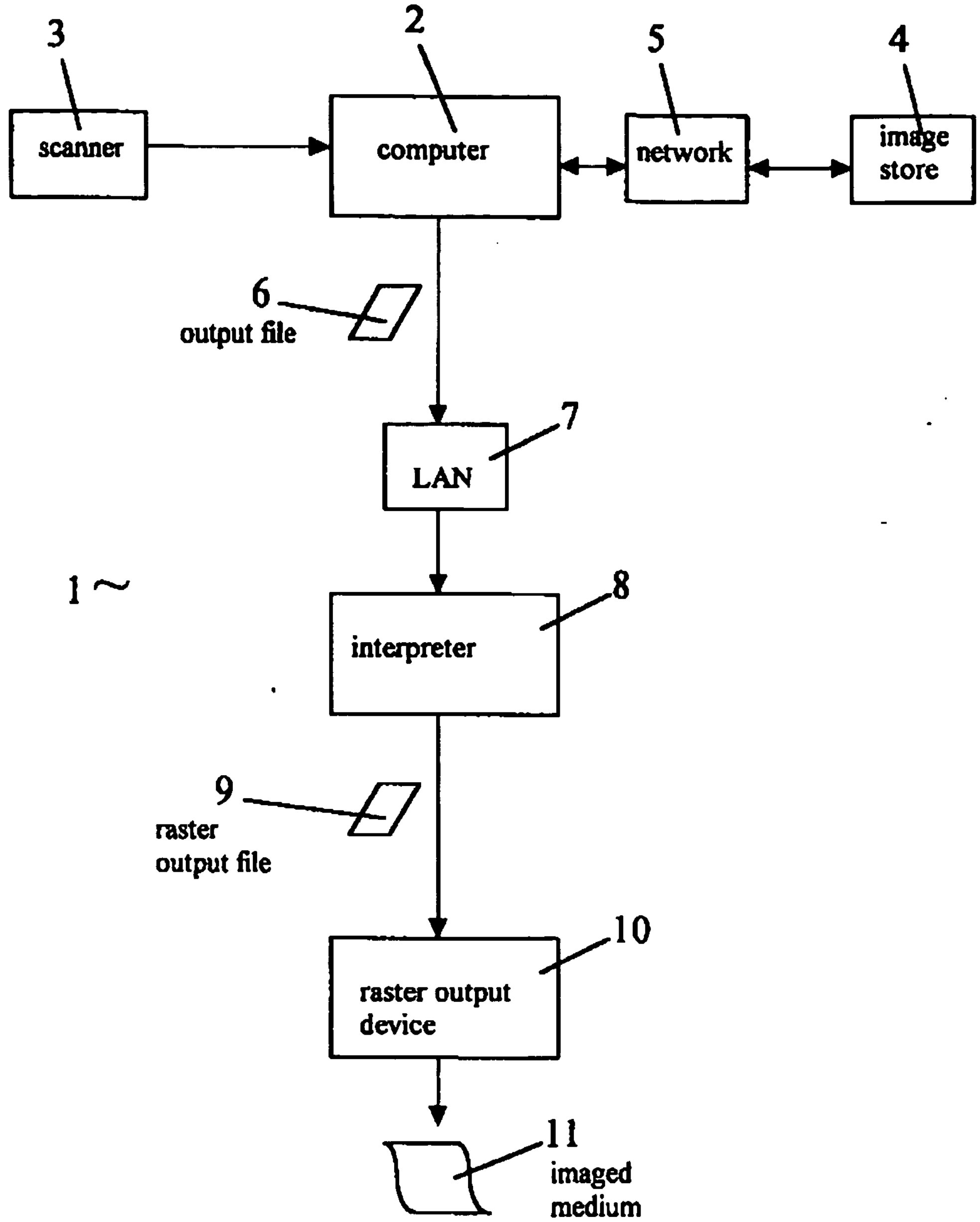

3
2
5
4
scanner
computer
network
image store
6
output file
7
LAN
1
8
interpreter
9
raster output file
10
raster output device
11
imaged medium

Fig. 1

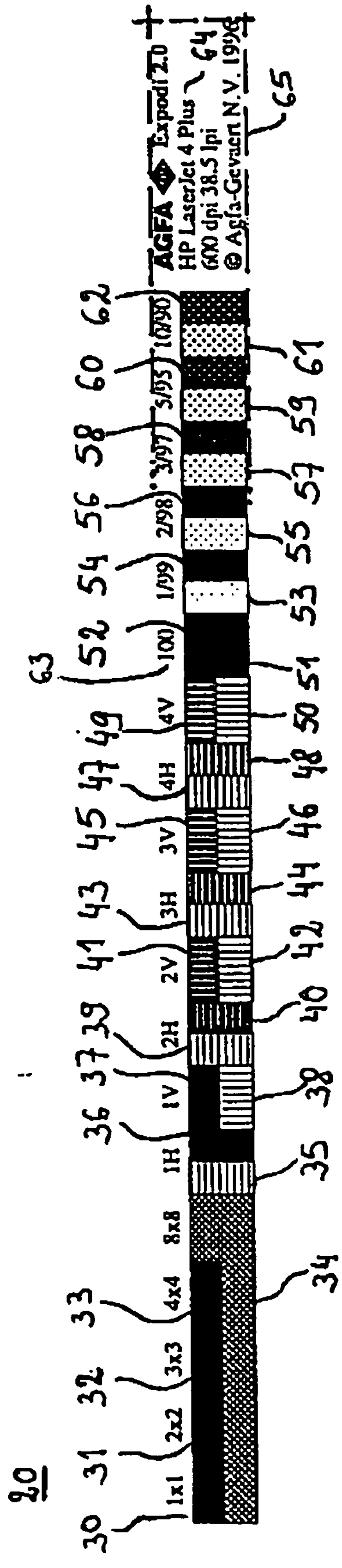

1x1
2x2
3x3
4x4
8x8
1H
1V
2H
2V
3H
3V
4H
4V
100
1/99
2/98
3/97
5/95
10/90
AGFA Expodi 2.0
HP LaserJet 4 Plus
600 dpi 38.5 lpi
© Agfa-Gevaert N.V. 1996

Fig. 2

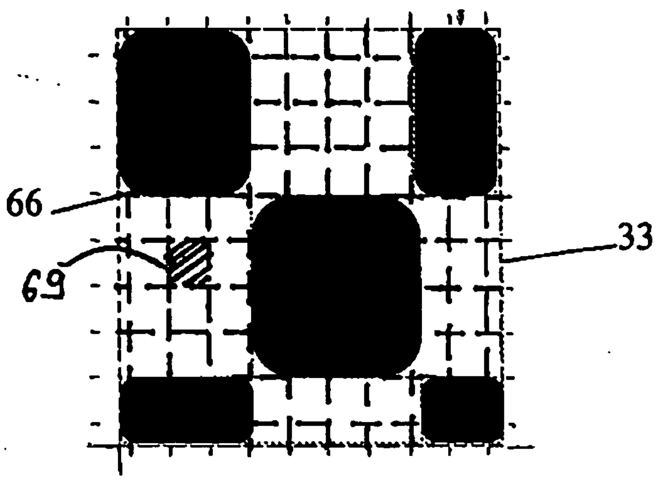


Fig. 3

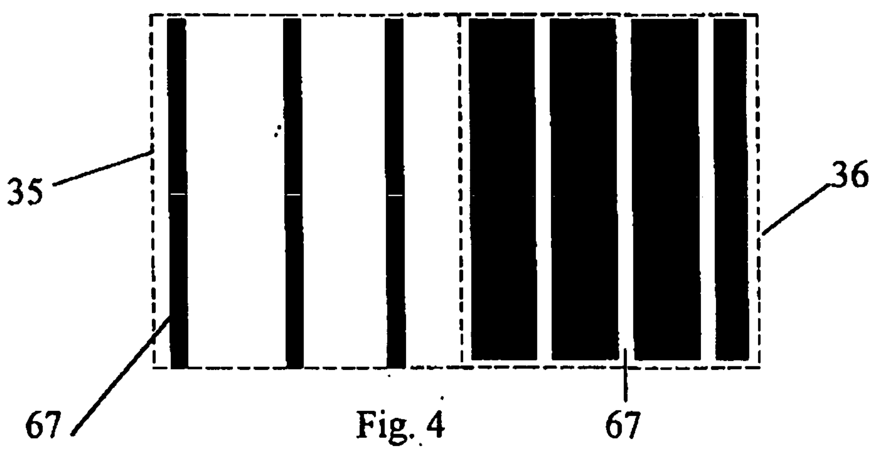


Fig. 4

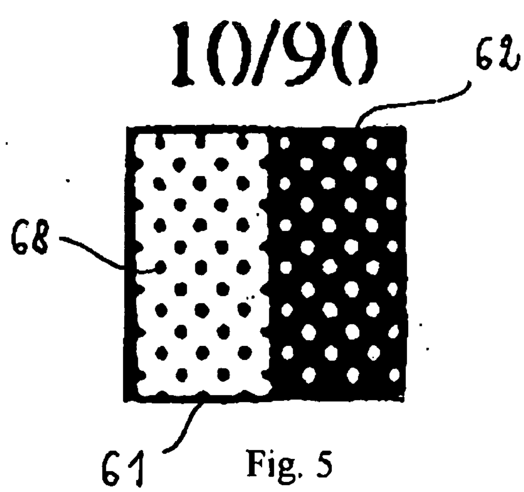


Fig. 5

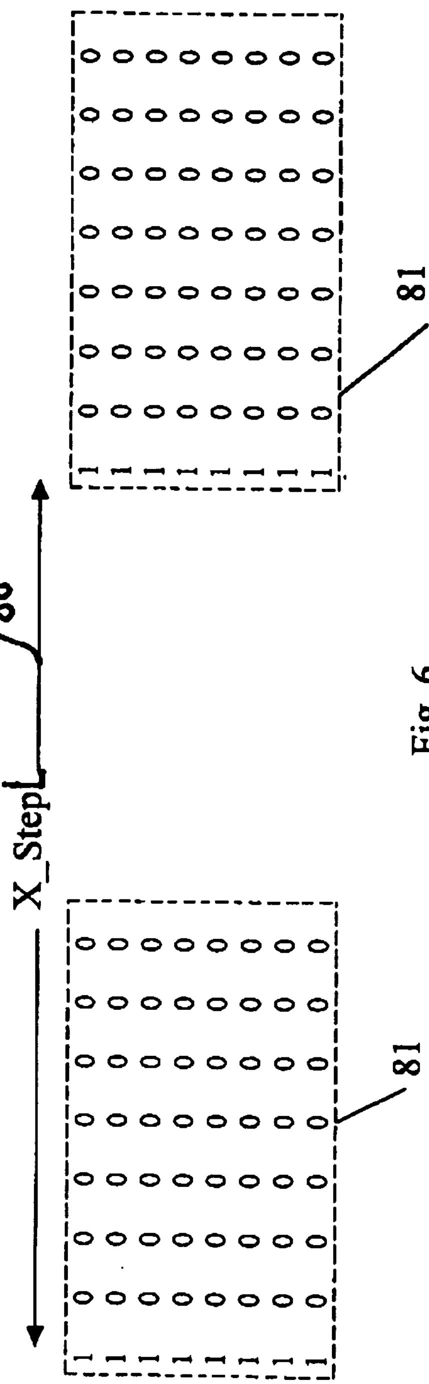


Fig. 6

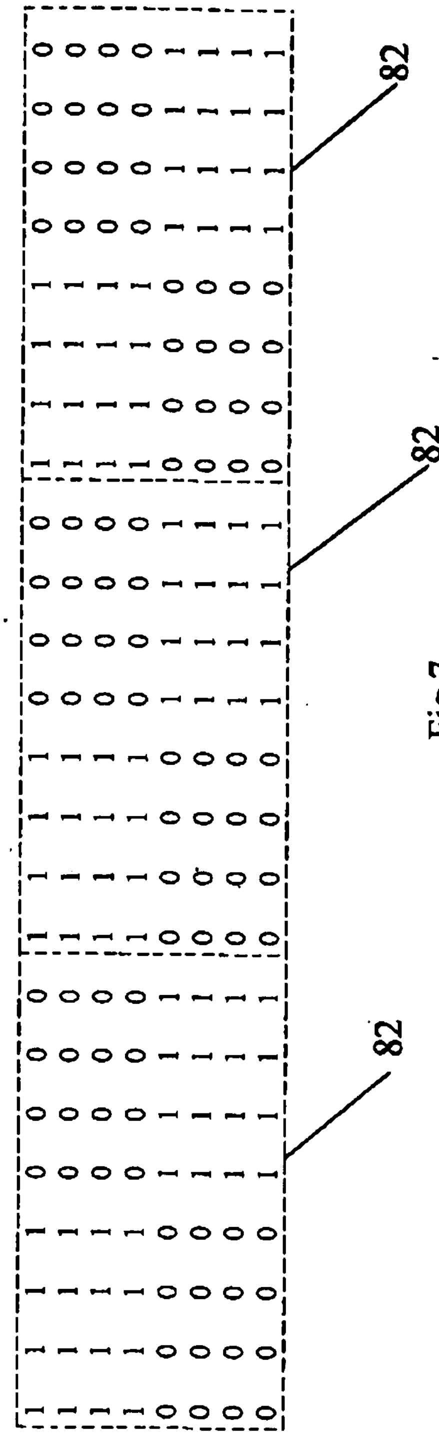
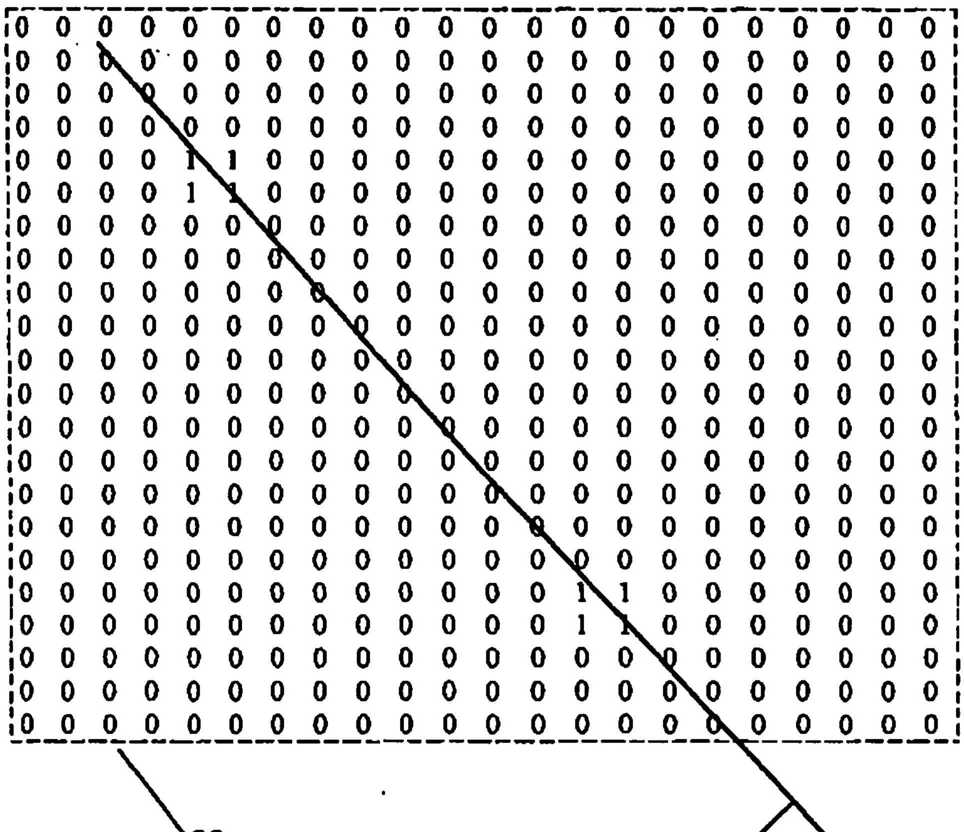


Fig 7



83

84

Fig. 8

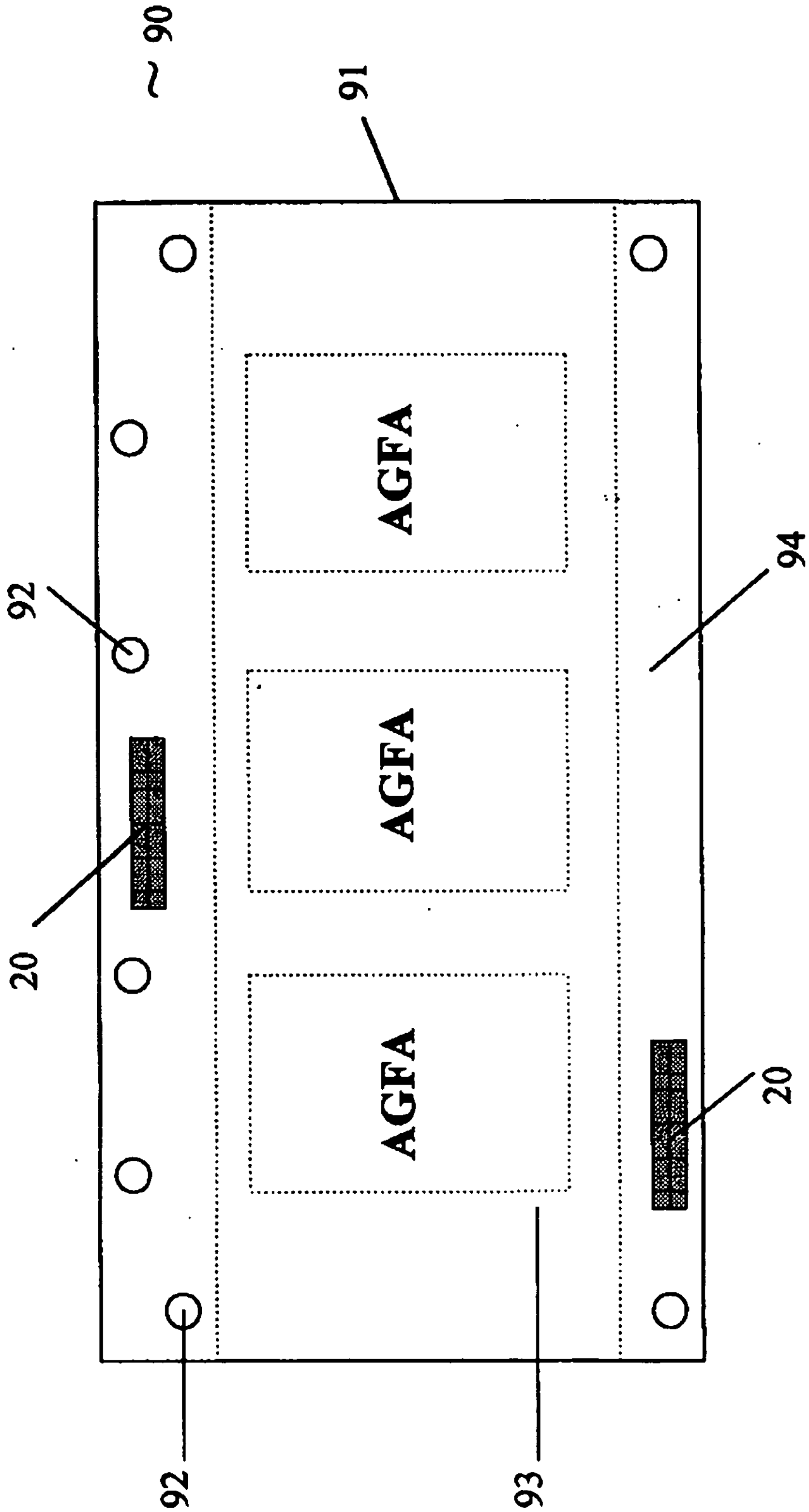


Fig. 9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 20 2333

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,Y	CH 681 929 A (UGRA) * page 2, line 19 - line 22 * * page 2, line 34 - line 51 * * page 4, line 21 - line 58 * ---	1,2,5-8, 10,11, 13-16	B41F33/00
D,Y	US 4 852 485 A (F. BRUNNER) * column 4, line 37 - column 5, line 19 * ---	1,2,5-8, 10,11, 13-15	
Y	FR 2 206 868 A (AMERICAN HOECHST CORP.) * the whole document * ---	8,16	
Y	US 5 031 534 A (F. BRUNNER) * column 4, line 49 - line 62 * ---	11	
A	EP 0 518 525 A (HEWLETT-PACKARD COMPANY) ---		
A	US 4 310 248 A (N. J. MEREDITH) -----		TECHNICAL FIELDS SEARCHED (Int.Cl.6) B41F H04N

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17 February 1997	De Roeck, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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